

California Cretaceous *Haliotis*

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(with part of 1 Plate)

AT THE BEGINNING of this century, F. M. ANDERSON (1902: 75; pl. 9, fig. 183) described a small fossil *Haliotis* from the Upper Cretaceous of Point Loma, near San Diego, California. The specimen, associated with *Pecten californicus* and *Acteonina pupoides*, had been collected by H. W. Fairbanks from "...below the beds contain[ing?] *Coralliochama orcutti* according to the statements of Dr. Fairbanks." It was illustrated by a crude pencil drawing (repeated in ANDERSON, 1958: pl. 21, fig. 12). Although ANDERSON in his original description (1902: 75) noted its resemblance to *Haliotis iris*, the systematic position of the specimen has been doubted. WOODRING (1931: 35) was sceptical of its generic assignment and COX (in MOORE, 1960: 221 - 222) noted that it and other putative Cretaceous haliotids needed to be confirmed. VOKES (1935: 251), after examination of the holotype, affirmed that it was a true *Haliotis*, as did HERTLEIN (1937). I have examined the specimen and because it has never been adequately illustrated and clearly is similar to *H. iris* as stated by Anderson, I am illustrating it photographically.

The specimen is now in the type collection (no. 69) of the Department of Geology of the California Academy of Sciences (CAS), San Francisco. It is in 2 parts, imbedded in a fossiliferous hard, dark gray-green gritty fine sandstone. The associated fossils include fragments of a small oyster, calcareous algae, an echinoid spine, a cross section of a gastropod, a serpulid tube, an external mold of a small fragment of a heteromorph ammonite, and a fragment of a pelecypod. Anderson reported that it came from below the *Coralliochama* horizon at Point Loma. The lithology of the matrix suggests that the specimen came from the Kr(b) member (above basal redbeds) of the Rosario Formation as shown in the columnar section of MILOW & ENNIS (1961: 26 and 36, Stop #10). POPENOE, IMLAY & MURPHY (1960) assigned the Rosario Formation at Point Loma to the Lower Maestrichtian, although they implied that there is some uncertainty as to whether the formation extends down into the Campanian. Thus, it is probable that Anderson's species is of early Maestrichtian age but it might possibly be of latest

Campanian age. It is clear that *Haliotis* was present in the late Cretaceous of California.

The type specimen is very similar to small specimens of *Haliotis iris* Martyn, 1784, the type species of the subgenus *Paua* Fleming, 1952, so *H. lomaensis* is assigned to this subgenus.

This paper has benefitted from discussions with Carole S. Hickman and Joseph H. Peck, Jr.

## SYSTEMATICS

*Haliotis* Linnaeus, 1758Type species: *Haliotis asinina* Linnaeus, 1758

The shell of *Haliotis asinina* is very elongate and narrow, with the apex very eccentric. Very few species are similar to it and assignable to the typical subgenus. In the Treatise on Invertebrate Paleontology (MOORE, 1960) 11 subgenera are recognized. FLEMING (1952) reviewed some of these when he proposed the subgenus *Paua*.

*(Paua)* Fleming, 1952Type species: *Haliotis iris* Martyn, 1784 (figured herein, Figures 13, 16, 17)

Shell of few whorls, last whorl rising above apex; outer lip extending around behind apex for about a half volution (see Figure 16) and overlapping the columellar flange (in Fleming's diagnosis, the terminology is confusing), which forms a broad posterior labral area; a slight angulation at the row of tremata; mature shells with adductor scar deeply incised but not apparent on small shells; posterior labral area forms posterior shell margin; ornamentation collabral and sometimes with faint oblique undulations and inconspicuous spiral cords.

According to the Treatise on Invertebrate Paleontology (MOORE, 1960: 1223) *Paua* has a range of Miocene to Recent in New Zealand and Japan; the assignment of *Haliotis lomaensis* to the subgenus extends it back to the late Cretaceous. This suggests that *Paua* may be near

the ancestral stock of the haliotids, but it is highly specialized in the greatly enlarged body whorl. The types of the 2 other reputed Cretaceous haliotids, *H. antiqua* Binkhorst, 1861, and *H. cretacea* Lundgren, 1894, need to be restudied.

*Haliotis (Paua) lomaensis* Anderson, 1902

(Figures 14, 15)

*Haliotis lomaensis* ANDERSON, 1902: 75; pl. 9, fig. 183; - WOODRING, 1931: 34-35; - VOKES, 1935: 251 - ANDERSON, 1958: 146; pl. 21, fig. 12 (reprint of 1902 drawing)

Shell small, length 13 mm, width 9.6 mm; outermost surface poorly preserved, but most of shell present; apex very eccentric, with at least one volution (very similar to *Haliotis iris*, compare Figures 13 and 15); last 4 tremata open and at least 2 earlier ones closed; shell profile with slight angulation along row of tremata; outer lip extends well around spire (see Figure 15) overlapping columellar flange as in *H. iris*; posterior labral area forms shell margin; microstructure of shell where observable suggests that there may have been inconspicuous spiral cords.

The shell is somewhat recrystallized and the nacreous character of the inner layers lost although in some areas the laminated character of the original nacre is still apparent. Anderson's original drawing suggests the presence of a ridge just adapical to the row of tremata - this part of his drawing is based on the internal mold of this area of the shell and actually represents a low ridge on the interior (not exterior) of the shell just adapical to the tremata. None of the specimens of the Recent *Haliotis iris* that have been examined have this structure. No evidence of a strongly impressed adductor muscle scar can be recognized on Anderson's type, but the internal surface of the shell is not well preserved in the area where it would be expected.

The very eccentric small apex, outer lip extending around posterior to apex and merging with columellar flange, and the combined flattened columellar flange - outer lip forming the posterior margin of the shell indicate that this species should be assigned to the subgenus *Paua*.

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